

WEATHER, FORECASTS, AND WARNINGS FOR THE MONTH.

By EDWARD H. BOWIE, In charge, Forecast Division.

The barometric pressure at the opening of the month was much above normal in high latitudes, being abnormally so in Siberia, the region of Iceland, and over Alaska. Pressure was below normal over the Atlantic Ocean in middle latitudes and over the Pacific Ocean—a pressure distribution which had prevailed during the last decade of November when stormy weather prevailed over southern Europe and off the east coast of the United States. On the 2d and 3d a decided fall in pressure set in over the eastern portion of the Atlantic Ocean, and following it, unsettled, stormy weather prevailed over the British Isles and western Europe. On the 8th a decided storm area was immediately west of the British Isles, and on that date the pressure fell to 28.52 inches at Valencia, Ireland, and gales and general rains followed over the British Isles, the North Sea, and western Europe. On the 9th and 10th stormy weather continued over the eastern portion of the North Atlantic Ocean and western Europe, and whole gales causing the loss of a number of lives and ships were reported. Stormy weather continued over the British Isles and western Europe until the 14th, caused by a disturbance which moved northeastward to the north coast of Scotland, where it decreased in intensity, but on the 16th another disturbance, pressure 28.68 inches at its center, appeared on the west coast of Ireland and passed thence over the North Sea on the 17th. These disturbances over the eastern portion of the Atlantic Ocean resulted in a prolonged period of stormy weather over practically the whole of Europe and the British Isles, and press reports were to the effect that much damage to shipping from gales and to interior districts by floods had resulted.

On the 8th, 9th, and 10th the pressure increased decidedly over Alaska, and on those dates the lowest temperatures of the season were recorded in that region. On the 9th, the lowest temperature at Tanana was 46 degrees below zero. Low temperatures continued in the interior of Alaska until the 15th, when a marked increase in temperature and rapid fall in pressure set in over that region.

In the United States the month of December opened with a general cold wave prevailing in all districts east of the Rocky Mountains, and on the 1st frosts and freezing temperatures were reported from the Gulf States and northern Florida, and snow continued in the Great Lakes region, the upper Ohio Valley, and the North Atlantic States, attended by strong north to west winds. Warnings of the occurrence of these winds were sent to stations on the Great Lakes and ports on the North Atlantic coast. Freezing temperatures were reported from northern Florida and frosts from central Florida on the 2d, 3d, and 4th, warnings of which were issued in ample time to protect truck and orchards.

The following weekly forecast was issued Sunday, December 4:

A continuation of low temperatures over the country east of the Rocky Mountains during the greater part of the week beginning December 5 is indicated by the International Weather Charts. West of the Rocky Mountains the weather will be unsettled without marked temperature variations but with rains in the Pacific States and the northern plateau region during the next several days. A disturbance that was over the Rocky Mountain region Sunday will advance eastward and reach the Atlantic States by Monday night or Tuesday. During its passage eastward this disturbance will cause snow in northern, rain or snow in central, and rain in southern districts from the Mississippi Valley eastward during the first part of the week. Following this disturbance a general change to colder weather will spread eastward and southward as far as the Gulf States by Monday night or Tuesday. Another disturbance will appear on the north Pacific coast Tuesday, cross the Middle West Wednesday or Thursday, and the Atlantic States during the latter part of the week.

On the 3d a disturbance appeared on the north Pacific coast; on the 4th its center was over Colorado, on the 5th over

Mississippi, and on the 6th off the Virginia coast, whence it passed northeastward to the Canadian Maritime Provinces. This was the first widespread storm of the winter, causing snow in practically all districts, except the Gulf States, from the Rocky Mountains to the Atlantic coast, and on the 5th and 6th heavy snows in the upper Ohio Valley, the Middle Atlantic States, and southern New England. On the morning of the 5th, when the storm center was over Mississippi, heavy-snow warnings were sent throughout the regions where heavy snows fell, and storm warnings were displayed on the Gulf coast, the Atlantic coast from Jacksonville to Boston, and on the Great Lakes except Superior. This disturbance increased in intensity during its movement northeastward from Mississippi to the Middle Atlantic coast, and high winds occurred on the Middle Gulf coast, the entire Atlantic coast north of Jacksonville, and over the southern portion of the Lake region. In connection with this storm the following report from the official in charge, local office, Weather Bureau, Pittsburg, Pa., is of interest:

On the 5th a heavy snow warning was issued to all transportation lines operating in the Pittsburg district. The different lines got together crews ready to operate the snow machines and during the night following, while the snow was falling heavily, started the machines to work. The snowfall in the mountain districts amounted to from 10 to 15 inches, and by acting promptly on the information furnished by this office the transportation companies were able to keep their lines open with very little inconvenience or loss of time in the operation of the trains.

Following this disturbance a decided change to colder weather spread southward over the Gulf States to Florida, where freezing temperature was reported in northern portions the night of the 6th and on the night of the 7th as far south as Arcadia. Ample warnings of the approach of this cold wave were given.

The season for the display of storm warnings on the Great Lakes closed at the termination of December 6, 1910. An Associated Press report of the 13th stated:

There were fewer disasters on the Great Lakes during the season just closed than during the season of 1909. Last year there were 128 lives lost, a much higher toll than for 1910. The worst disaster of the year was the sinking of car ferry No. 18, of the Pere Marquette Railroad, off Ludington, Mich., with the loss of more than a score of lives. The greatest monetary loss of the 1910 season occurred when the steamer *W. C. Moreland* was stranded off Eagle River Reef, Lake Superior. The loss to the hull was \$420,000 and to the cargo \$40,000. There were eight important fires, accidents, and wrecks during the year. The total resulting loss was \$1,500,000.

Another disturbance appeared in the Northwest on the 6th and moved thence eastward along the northern border, attended by snow from the upper Mississippi Valley eastward over the Great Lakes and the North Atlantic States during the 7th and 8th.

On the 7th the snow over the lower Lake region was attended by strong southwest shifting to northwest winds. During the 8th, 9th, and 10th, the coldest weather of the season prevailed in the Eastern States, and frosts occurred as far south as central Florida.

On the 8th, a disturbance appeared in the extreme Northwest; on the 9th it was over the northern Plains States; and on the 10th it covered the Mississippi Valley. On the latter date snow fell in the Lake region and the Ohio Valley and at scattered points in the upper Mississippi Valley. This disturbance was attended by a marked rise in temperature during its passage from the Northwest to the Atlantic coast, and on the night of the 10th and on the 11th snows fell in the Lake region and the Middle Atlantic and New England States.

The following weekly forecast was issued Sunday, December 11:

Cold weather will continue the first part of the coming week throughout the northern and central districts east of the Rocky Mountains and in the East Gulf and South Atlantic States, followed by a change to considerably higher temperature on or after Wednesday the 14th. No unusually low temperatures are probable west of the Rocky Mountains during the next several days. The principal disturbance of the week will appear on the Pacific coast Monday or Monday night, cross the Middle West Tuesday or Wednesday and reach the Atlantic coast by Thursday. This disturbance will be attended by general precipitation, which will be in the form of rain in southern and snow and rain in northern and central districts.

Following the storm that crossed the country, 8th to 11th, a pronounced area of high pressure appeared in the Northwest on the 10th and advanced thence to the South-eastern States by the 14th, accompanied by much colder weather in all districts east of the Rocky Mountains. On the 13th the pressure fell rapidly in the Northwestern States and on the 14th an extensive area of low pressure was central in the Hudson Bay region. This disturbance was attended by westerly gales over the Great Lakes, and on the morning of the 14th southwest storm warnings were ordered for the Atlantic coast from Sandy Hook to Eastport.

A marked rise in temperature set in over the Northwestern States on the 13th and this change to warmer weather overspread all sections east of the Rocky Mountains in the ensuing 36 hours. On the 15th the center of this low-pressure area moved to the lower Lake region and on the morning of the 16th its center was off the New England coast, whence it moved rapidly eastward to the Banks of Newfoundland. This disturbance was attended by west and northwest gales from Norfolk to Eastport and a number of vessels were wrecked off the coast of New England. Storm warnings were displayed 24 hours in advance of the occurrence of these destructive winds. The highest velocities reported were 60 miles an hour at New York City and Block Island the night of the 15th. Following this storm area a cold wave developed north of the Great Lakes and quickly overspread the Lake region, the upper Ohio Valley, and the Middle Atlantic and New England States the afternoon and night of the 15th. Cold-wave warnings were issued for these regions the morning of the 15th.

The following weekly forecast was issued Sunday, December 18:

The general barometric pressure distribution over the Northern Hemisphere is such as to indicate that the coming week will be one of moderate temperature for the season in practically all parts of the country. A disturbance that covered the Great Lakes Sunday will move eastward and cause snow in that region and snow or rain in the Middle Atlantic and New England States Monday. Another disturbance will appear in the Northwest Monday night or Tuesday and move thence along the northern border and reach the St. Lawrence Valley Thursday; the precipitation attending this disturbance will not be general. In the Southern and Western States the week will be one of generally fair weather.

On the 18th pressure fell rapidly over the Western and Northwestern States and on the 20th a well-defined disturbance was over the Great Lakes, whence it passed slowly eastward to the New England coast on the 21st. This disturbance was attended by general precipitation from the Mississippi Valley eastward, and was followed by a change to considerably colder weather, without, however, the characteristics of a cold wave. On the 21st frost occurred in northern Florida and again on the 22d in northern and central Florida, the temperature dropping to 34 degrees as far south as Arcadia. Temperatures on the morning of the 22d were below zero in northern New England and extreme northern New York. Strong west and northwest winds prevailed off the New England and Middle Atlantic coasts on the 21st. On the 19th and 20th the pressure fell rapidly over Alaska and on the 21st this disturbance appeared in the Northwest, whence it advanced eastward,

attended by general precipitation, and reached the Atlantic coast on the 23d. Storm warnings were ordered for the Gulf and Atlantic coasts well in advance of the storm and high winds were reported from a number of coast ports. The highest wind velocity reported was 52 miles an hour from the east at Pensacola on the night of the 22d. A change to much colder weather followed this disturbance, and cold-wave warnings were issued on the 23d for the upper Mississippi Valley, the upper Lake region, and on the 24th for northern New York and northern New England.

The following weekly forecast was issued Sunday, December 25:

The coming week will open with cold weather Monday in the Eastern States and moderate temperatures elsewhere during the next several days. A disturbance of moderate intensity that is now in the Southwest will advance eastward and reach the Atlantic States Tuesday. It will be preceded by rising temperature and attended by unsettled weather with rain or snow in Northern and Central States east of the Rocky Mountains. The principal disturbance of the week will reach the Pacific States Tuesday or Wednesday, cross the middle West by Thursday, and advance to the Atlantic States Friday or Saturday. It is probable that this disturbance will be attended by general precipitation and be followed by a pronounced change to colder weather. This cold wave will appear in the Northwest Wednesday or Thursday and advance thence eastward to the Atlantic coast and southward to the Gulf of Mexico by the close of the week.

The pressure remained low in the middle West and Southwest on the 26th and 27th and on the latter date a well-defined disturbance was central over the southern Plains States, which moved to Indiana on the 28th and to the St. Lawrence Valley on the 29th, attended by rains in the middle Plains States, the Ohio and middle Missouri valleys, and rain and snow in the Lake region and the New England States. Another disturbance developed over Texas on the 28th and it caused widespread precipitation from the Plains States eastward from the 29th to 30th. This in turn was followed by a pronounced change to colder weather, which appeared in the Northwest Wednesday and by Thursday night had overspread the Plains States and the Mississippi Valley. Cold-wave warnings were issued the morning of the 29th for Minnesota, Wisconsin, eastern Iowa, northern Illinois, Kentucky, western Tennessee, and the middle Gulf States, and storm warnings were displayed on the Gulf coast at Galveston and from Mobile to Carrabelle.

The month closed with cold weather in New England and in the Northwest.

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since Jan. 1.	Average departures since Jan. 1.
New England.....	12	23.9	-5.5	+ 9.2	+0.8
Middle Atlantic.....	15	29.0	-5.9	+ 4.5	+0.4
South Atlantic.....	10	42.3	-4.8	- 0.6	0.0
Florida Peninsula * ..	8	55.5	-5.0	-10.9	-0.9
East Gulf.....	11	46.0	-3.1	- 4.2	-0.3
West Gulf.....	10	49.4	+0.9	+13.1	+1.1
Ohio Valley and Tennessee.....	13	31.3	-5.8	- 4.5	-0.4
Lower Lakes.....	10	23.5	-6.8	- 1.2	-0.1
Upper Lakes.....	12	21.2	-3.1	+17.0	+1.4
North Dakota * ..	9	12.7	+0.1	+26.5	+2.2
Upper Mississippi Valley.....	14	25.5	-1.9	+ 9.1	+0.8
Missouri Valley.....	11	27.7	+0.2	+21.0	+1.8
Northern slope.....	9	26.6	+2.9	+30.0	+2.5
Middle slope.....	6	35.2	+2.2	+27.3	+2.3
Southern slope * ..	8	41.8	+0.9	+19.3	+1.6
Southern Plateau * ..	11	43.2	+2.7	+21.0	+1.8
Middle Plateau * ..	10	30.8	+3.4	+22.8	+1.9
Northern Plateau * ..	10	32.3	+1.3	+13.9	+1.2
North Pacific.....	7	43.2	+1.6	+ 0.3	0.0
Middle Pacific.....	5	49.8	+1.5	- 1.2	-0.1
South Pacific.....	4	55.0	+2.3	+15.7	+1.3

* Regular Weather Bureau and selected cooperative stations.

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		<i>Inches.</i>		<i>Inches.</i>	<i>Inches.</i>
New England.....	11	2.68	76	-0.7	-6.7
Middle Atlantic.....	15	2.63	84	-0.5	-5.5
South Atlantic.....	11	1.97	54	-1.7	-9.0
Florida Peninsula *.....	8	0.77	27	-2.1	-7.4
East Gulf.....	11	3.56	78	-1.0	-7.6
West Gulf.....	10	2.53	89	-0.3	-7.8
Ohio Valley and Tennessee.....	13	3.24	94	-0.2	-1.2
Lo ver Lakes.....	10	2.47	86	-0.4	-1.9
Upper Lakes.....	12	1.50	71	-0.6	-6.5
North Dakota *.....	9	0.35	54	-0.3	-7.2
Upper Mississippi Valley.....	15	0.89	50	-0.9	-9.8
Missouri Valley.....	11	0.75	71	-0.3	-5.0
Northern slope.....	9	0.51	72	-0.2	-3.0
Middle slope.....	6	0.30	38	-0.5	-7.7
Southern slope *.....	8	0.23	22	-0.8	-12.2
Southern Plateau *.....	11	0.42	51	-0.4	-2.9
Middle Plateau *.....	11	0.96	91	-0.1	-3.5
Northern Plateau *.....	10	1.11	61	-0.7	-1.8
North Pacific.....	7	6.08	76	-1.9	-2.9
Middle Pacific.....	7	1.78	41	-2.6	-10.9
South Pacific.....	4	0.34	16	-1.8	-7.6

* Regular Weather Bureau and selected cooperative stations.

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England.....	75	+ 1	Upper Mississippi Valley.....	75	- 3
Middle Atlantic.....	74	- 1	Missouri Valley.....	77	+ 2
South Atlantic.....	74	- 4	Northern slope.....	76	+ 8
Florida Peninsula.....	80	- 1	Middle slope.....	62	- 4
East Gulf.....	72	- 5	Southern slope.....	62	- 4
West Gulf.....	70	- 4	Southern Plateau.....	56	+ 10
Ohio Valley and Tennessee.....	77	+ 1	Middle Plateau.....	73	+ 3
Lower Lakes.....	80	+ 2	Northern Plateau.....	80	0
Upper Lakes.....	82	0	North Pacific.....	90	+ 4
North Dakota.....	89	+ 10	Middle Pacific.....	79	- 3
			South Pacific.....	68	- 1

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England.....	6.4	+ 0.3	Upper Mississippi Valley.....	5.1	- 0.7
Middle Atlantic.....	5.8	+ 0.6	Missouri Valley.....	5.1	- 0.1
South Atlantic.....	4.0	- 0.8	Northern slope.....	5.4	+ 0.2
Florida Peninsula.....	3.4	- 1.3	Middle slope.....	4.0	- 0.1
East Gulf.....	5.4	- 0.1	Southern slope.....	5.0	0.0
West Gulf.....	5.5	+ 0.3	Southern Plateau.....	3.6	+ 0.4
Ohio Valley and Tennessee.....	6.6	+ 0.3	Middle Plateau.....	5.9	+ 1.1
Lower Lakes.....	7.7	0.0	Northern Plateau.....	7.8	+ 1.0
Upper Lakes.....	7.4	+ 0.1	North Pacific.....	8.4	+ 2.1
North Dakota.....	5.9	+ 0.5	Middle Pacific.....	6.0	+ 1.6
			South Pacific.....	4.9	+ 1.1

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Block Island, R. I.....	6	52	ne.	Mount Tamalpais, Cal.....	30	57	nw.
Do.....	15	64	nw.	Do.....	31	54	nw.
Do.....	16	60	nw.	Do.....	15	61	nw.
Do.....	30	62	nw.	New York, N. Y.....	1	58	se.
Buffalo, N. Y.....	13	50	sw.	North Head, Wash.....	2	56	se.
Do.....	14	63	sw.	Do.....	5	50	se.
Burlington, Vt.....	23	50	s.	Do.....	7	52	se.
Cape May, N. J.....	15	52	nw.	Do.....	22	54	se.
Cheyenne, Wyo.....	4	60	w.	Do.....	23	50	se.
Cleveland, Ohio.....	15	55	nw.	Do.....	29	60	se.
El Paso, Tex.....	31	53	sw.	Do.....	30	60	nw.
Fort Worth, Tex.....	6	50	nw.	Do.....	31	54	nw.
Mount Weather, Va.....	2	56	nw.	Do.....	22	52	se.
Do.....	13	52	w.	Pensacola, Fla.....	16	54	nw.
Do.....	15	66	nw.	Point Reyes Light, Cal.....	17	65	nw.
Do.....	16	58	nw.	Do.....	24	50	nw.
Do.....	20	58	w.	Do.....	27	55	nw.
Do.....	21	58	nw.	Do.....	30	62	nw.
Do.....	22	52	nw.	Do.....	31	65	nw.
Do.....	24	56	nw.	Southeast Farallon, Cal.....	31	51	n.
Do.....	25	52	nw.	Tatoosh Island, Wash.....	3	63	s.
Do.....	30	68	nw.	Do.....	5	54	se.
Mount Tamalpais, Cal.....	16	54	n.	Do.....	19	52	ne.
Do.....	17	59	ne.				
Do.....	27	60	nw.				

RIVERS AND FLOODS, DECEMBER, 1910.

By Prof. H. C. FRANKENFIELD, in charge of River and Flood Division.

There were no floods during the month, and river stages did not vary greatly from those that prevailed during the month of November. The rains and high temperatures during the closing days of the month caused a general rise in the great interior rivers, to which the melting snows in the northern districts contributed materially.

At the end of the month the Missouri River was frozen almost as far south as Omaha, and floating ice was seen at various times during the month at all places below. The ice gorged at the Wabash bridge at Hannibal, Mo., on December 9, and from that time to the end of the month the Mississippi River was closed to the northward. No ice of consequence was observed below Cairo, Ill.

The warm rains of December 29 and 30 started the ice in the Allegheny River, and it passed down into the Ohio River on December 30 with a crest stage of 17.7 feet at Freeport, Pa., 2.3 feet below the flood stage, and of 16.3 feet at Pittsburgh, Pa., 5.7 feet below the flood stage. The gorge at Wolf Creek in the lower Ohio broke at 11 a. m., December 29. The warm rains had softened the ice considerably, and no damage resulted. A gorge that had formed near the mouth of the great Kanawha broke on December 26 without damage, although for the time conditions were very threatening.

The ice in the west branch of the Susquehanna River broke on December 29 and moved out on a moderate tide, gorging again during the night of December 30 at Nippono Park, about 10 miles below Williamsport, Pa. On the north branch of the Susquehanna River the ice moved out during the night of December 30, and reached Wilkes-Barre, Pa., during the following night on an 8-foot stage of water.

In the main stream the ice remained intact, the dam at McCall's Ferry holding the ice that came from the branches, and forming a gorge that extended back to Columbia, Pa., a distance of about 18 miles.

In the Potomac River the ice impeded navigation more or less for about three weeks, but conditions did not become serious except to sailing craft.

The lower Connecticut River closed on December 11, and navigation was suspended for the season.

Reports from snowfall stations in the West show a very light fall as a rule, but in some of the northern districts east of the Rocky Mountains continuous cold weather held the snow quite solid and compact with very little melting.

On December 1 the river district of Indianapolis, Ind., was established with territory comprising the watershed of the Wabash River above the mouth of and including the White River, and the river district of Cairo, Ill., curtailed accordingly. A new river station was opened at Anderson, Ind., on the West Fork of White River, and daily observations will also be taken at Indianapolis, on the same river. Stations were also opened at Attica, Bluffton, and Logansport, Ind., on the Wabash River. Rainfall observations from the corn and wheat station at Farmland, Ind., will also be available.

Hydrographs for typical points on several principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.